REMARKS

Claims 1-13 remain in the application. Claims 1, 3-6 and 12 have been amended to change the bisulfate content with basis for the amendments supported by Table 2 the paragraph following Table 2 in the specification, and to describe the basis weight of the mat to be within the range of about 50 – 225 grams per square meter, basis found in the latter portion of the first paragraph of the Brief Summary of the Invention. Claim 1 now also describes the fibers in mat as consisting essentially of polymer fibers and describes the binder content as about 16-30 wt. percent, basis found in the first paragraph of the Brief Summary of the Invention and in original claim 13. These amendments further clarify the type fibers and binders in the claimed fibrous mats, with further basis found in the first and third paragraphs of the Detailed Description.

The claimed invention is a nonwoven polymer fibrous mat having a basis weight in the range of about 50 – 225 gms/sq. m and in which the fibers are bound together with about 16-30 wt. percent of a formaldehyde containing polymer resin latex binder of particular types that excludes phenol formaldehyde and a bisulfite compound in an amount of 1.25 wt. percent up to about 7.5 wt. percent, the latter additive providing excellent hot strength in the mat, at 200 degrees C., of no more than about 1 percent elongation, in the machine direction and low formaldehyde emissions as shown in Table 2.

Claims 1 –13 stand rejected under 35 USC 103 as being unpatentable over Taylor et al in view of Randall et al (20040209074 A1). The Examiner states that Taylor et al teaches the claimed invention except for using polymer fibers instead of glass fibers, but that doing so would be obvious to one of ordinary skill in view of the teachings of Randall. This rejection is respectfully traversed. Taylor et al does not teach or reasonably suggest the claimed invention, and the teachings of Randall et al do not suggest modifications to the Taylor et al manufacturing method or products to arrive at the presently claimed invention.

Taylor et al teach making a fiber glass <u>insulation batts</u>, col. 8, lines 36-37, by adding a bisulphate to a <u>urea modified</u>, <u>phenol formaldehyde</u> resin binder and spraying that binder onto hot glass fibers about 12 inches below a <u>spinning machine</u> used to make the fibers, and the binder just described. The fiber glass product made in the Examples of Taylor et al are

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insulation batts, note the "recovery" data and explanation in col. 8, lines 25-26 and 31-34. This is a very different product than the polymer fiber mats of the present invention, mats having hot strengths sultable for making roofing products in which the mats are subjected to hot asphalt up to about 200 degrees C. while being run through a manufacturing line at high speeds, see Table 1 and page 7 through page 8, line 31. Nothing in Taylor et al teaches or reasonably suggests using the kind of formaldehyde containing binders containing a bisulphate to make polymer fiber mats for making asphaltic roofing products, nor does Taylor et al teach or reasonably suggest using as much as 16 wt. percent binder in his glass fiber insulation. Further, Taylor et al do not teach or reasonably suggest that polymer fibers would be a suitable replacement for the glass fibers in the products they teach, or that the fiber glass products they teach would have the hot strength necessary, and be suitable for, impregnating with hot asphalt to make roofing products. Note that Taylor et al teach that the phenol formaldehyde binder is sprayed on hot glass fibers, something not done to make the nonwoven mats of the present invention, see example 1 in which the binder is applied to wet fibers.

As described above, verified by the testimony of Michael Fay, an expert in fiber glass wool insulation products and processes, in the attached Rule 1.132 Declaration, and further verified by the attached Exhibit, pages 24-27 of FIBER GLASS BY Mohr and Rowe, the fiber products taught by Taylor et al contain completely different types of fiber, very different amounts of very different binders. The Taylor et al products are thick, compared to nonwoven mats, compressible blankets having very different properties, and are used for a very different purpose than the nonwoven mats of the present invention. A typical example showing these things is that the main physical properties Taylor et al were concerned with were recovery and droop, properties that are not involved in nonwoven polymer fiber mats. Therefore, Taylor et al cannot reasonably suggest, in the sense of 35 USC 103, the presently claimed polymer fiber nonwoven mats.

Randall et al teach a gypsum containing structural panel, like wall board, having a gypsum core having on one or both faces a fibrous nonwoven mat with one side coated with a combination of a mineral pigment, a hydrophobic, UV resistant polymer latex adhesive binder, the pre-coated mat having a porosity that will allow water in the gypsum core to evaporate through the coated mat. In paragraph 65, Randall et al teach that a fibrous mat

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facer containing a blend of glass fibers and polyester fibers such as described in U.S. Pat. No. 5,883,024, and that the mat could be treated or coated as taught by Randall et al. The nonwoven mats disclosed in 5,883,024 are nonwoven mats containing a blend of 95-75 wt. percent glass fibers and 5-25 wt. percent polyester fibers bound together with an acrylic or PVC based binder, but no specific binder compositions or method of making are disclosed. Randall et al do disclose solution polymers used in the coating, but not latex or emulsion materials as used in our claimed products. In the present invention formaldehyde containing crosslinkers are in the latex binder for improved hot strength performance and the formaldehyde scavenger is needed to reduce release of formaldehyde during processing.

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Randall et al do not suggest using the binder taught by Taylor et al or the type of products taught by Taylor et al as a facer for gypsum cores, nor does anything in Randall et al reasonably suggest using polymer fiber/glass fiber blends in the process and products taught by Taylor et al.

For these reasons, there is no reasonable teachings or suggestions in either Taylor et al or Randall et al that would lead one of ordinary skill in the art to modify the products taught by either Taylor et al or Randall et al to achieve the presently claimed nonwoven mat products having the compositions and properties recited in the claims. Applicant respectfully requests the Examiner to withdraw this rejection and to allow all of the claims.

Claim 2 was rejected under 35 USC 103 as being unpatentable over Taylor et al in view of Randall et al as applied to claims 1 and 3-13 above and further in view of the disclosure of Hummerich et al. The Examiner urges that Hummerich et al teaches that it is known, to use acrylic copolymers and styrene in binder compositions including formaldehyde and therefore it would have been obvious to have used the binders disclosed in Hummerich et al in the processes and products taught by Taylor et al and Randall et al. This rejection is traversed for the same reasons given above for Taylor et al and Randall et al and further because Hummerich et al do not teach the binder used on the polymer fiber mats of claim 2, nor does Humeririch et al provide any motivation or reason to modify Taylor et al and/or Randall et al as that the Examiner urges would be obvious. Instead, this rejection appears to be one of hindslight after having the benefit of applicant's disclosure, and such is improper.

For these reasons, applicant believes that claims 1-13 are patentable under 35 USC 103 and respectfully requests the Examiner to withdraw this rejection and to allow all of the claims.

The disclosure of Graves et al, 5,362,842, has been reviewed, but applicant agrees with the Examiner that this reference, alone or in any reasonable combination, in no way would lead one of ordinary skill in the polymer fiber nonwoven mat art to the presently claimed invention. Graves et al teaches a particular type of urea formaldehyde resin for use in glass fiber mats. Plasticized urea formaldehyde binders have been used in fiber glass mats for decades.

Applicants believe that the claims are now in condition for allowance and look forward to receiving a notice of allowance. However, if the Examiner believes one or more issues still exist, to expedite disposal of this application, the Examiner is respectfully invited to call Applicants' attorney at the number listed below to discuss the issue or issues and a way of removing.

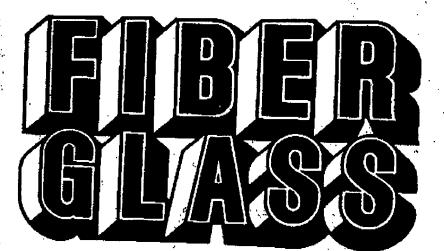
Respectfully submitted.

Attorney for Applicants

Robert D. Touslee Reg. No. 34,032 303.978.3927 Customer No. 29602 FROM : TECSERCO J MILLER

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Fig. 3-6. The method of burn-off at an intermediate temperature which removes the organic binder but does not change the glassy mass. Percent weight loss is then calculated.

plied to glass wool products may be evaluated by color (light or pinkish tan—probable undercure, unless artificially colored; dark tan to brown—good cure), by acetone extraction, water absorption, or degree of thickness recovery of the product after prolonged compression. Silicones are evaluated by surface (wetting) angle, and the other ingredients by specific quality and performance tests called out in their manufacturer's specifications.

The amount of binder present is a valuable control parameter and is determined by ignition at 1050°F of a dry, cured resin-glass sample and then calculating the percent weight loss (see Fig. 3-6).

Thickness and Density

These two parameters are so closely interrelated that, in the manufacturing process, a change in one invariably produces a compensating modification in the other. If a machine is producing at 1 in thickness and 1 lb/cu ft density, and the thickness is doubled to 2 in, the density per inch of thickness would be halved. Hence, the quantity of fiber input to the machine must be doubled to maintain the

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FIBER GLASS BLOWN WOOL OR INSULATION PRODUCTS

product at 1 lb density. Since a near-uniform fiber production rate is desirable, the required gain in the fiber input per unit area is accomplished by halving the machine speed, thereby permitting twice as much fiber to accumulate.

In the manufacture of wool fiber, thickness is usually controlled by raising or lowering a set of "flights" or flat segmented elements on a chain drive which contact and compress the top surface. These move at the same speed as the bottom or collecting open-mesh conveyor. The flights are also constructed of an expanded metal or other openmesh material to permit passage of heated air in the forced-draft curing oven.

Ultimate or specified thickness values of glass fiber and associated wool products are determined by the Gustin-Bacon "measurematic" null-balance device (see Fig. 3-7). In this unit the pressure of only a 3 g weight (to depress the few protruding surface fibers) is exerted by a plate which contacts the top of the test sample. Thicknesses vary in fiber glass end products from $\frac{1}{2}$ in. to as much as 8 in.

The accompanying density in blown fiber glass wool products is determined solely by weight of a sample 1 sq ft in area. Density may be made to vary from $\frac{1}{2}$ lb to as much as 7 lb/cu ft in some board



Fig. 3-7. Counterweighted null balance used to measure thickness of wool products as manufactured.

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26 FIBER GLASS

products. The upper limit on the flexible roll goods is approximately $2\frac{1}{2}$ lb/cu ft.

Hence it can be seen that many combinations of wool thickness and density are possible. Most product applications are based upon the best combination of the two to fulfill requirements of thermal, acoustical, or other service with performance balanced against cost. The close and necessary relationship between thickness and density will become more evident in the ensuing descriptions of individual products and their performance. (Fiber glass product density should not be confused with glass density mentioned earlier. Glass density refers to the factor of increase of the solid glass substance over the weight of an equivalent volume of water taken as unity.)

Percent Shot

As indicated, some of the processes generate a larger percentage of glassy beads or "shot" than others. The shot is often mobile, that is, not attached or adhered to adjoining fibers. Hence it may be removed by mechanical manipulation of a sample and weighed as a quality determination.



Percent Recovery

The degree of recovery after compression in insulation or wool products relates directly to the thickness which the manufacturer guarantees in his finished product specifications. The specifications for the product you want to purchase must be met under any and all conditions.

An austere condition exists in manufacture and packaging of either flat or roll-type insulation products. Unfortunately, they are usually compressed to conserve shipping space.

It would be most disconcerting to allow a 3 in. construction space for insulation, and when the material arrived for installation, find that it filled only a portion of the allotted space. In such an instance, naturally, the thermal efficiency and resistance to heat flow would be different than that originally designed for the building. Therefore, the industry sets and maintains rigid standards for recovery of the products to specified values.

The percent thickness recovery is influenced by the following: the original flight setting (usually original production thicknesses are

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FIBER GLASS BLOWN WOOL OR INSULATION PRODUCTS 2

slightly over specification); thickness itself (greater thicknesses generally have lower percent recovery); density (lower density-lower recovery); tightness of compression, rollup, etc., in packaging for shipment; type, age, formulation, and degree of cure of the bonding resin; and degree of relative humidity in the storage area (packaged insulation should be sealed inside non-moisture-transferring membranes).

Other Properties

Other functions of fiber glass and related mineral wool products such as resistance to heat transmission (thermal insulation), acoustical or sound absorption, "efficacy" as a filtration medium, and others will be detailed in the ensuing discussions of specific product applications and performances.

BUILDING INSULATION

Thermal Insulation—Homes

Insulation of homes against heat loss (winter) and heat gain (summer) probably represents the largest single usage for fiber glass and mineral wool products. Many different areas of the home may be thermally protected: ceilings, sidewalls, perimeters of slabs, floors, etc. Not only are many different types of available insulating materials used, but the way various components perform in combination must be taken into consideration in analyzing for the complete insulated structure, either in retrofitting or in new construction.

An understanding of the way insulation performs should start with consideration of the basic units of heat and related definitions.

HEAT LOSS DATA AND CALCULATIONS

(Reprinted from Johns-Manville Engineering Data on Building Products, #39Q, Feb. '75 or #FGBI-1, Nov. '75).

in the United States the basic unit of heat is generally considered to be the British Thermal Unit or, as it is commonly called, a Btu.

ERITISH THERMAL UNIT (Btu)—the amount of heat required to increase the temperature of one pound of water one deg Fahrenheit.

The basic unit of heat flow: i.e. the amount of heat that will be transmitted through a unit of material in a given time, is known as the thermal conductivity of a material.